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| 10/595,678 | 05/04/2006 | Kazuki Noda | 59018US007 | 4637 |

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| EXAMINER | |
|---|---|
| HENRY, CALEB E | |

| ART UNIT | PAPER NUMBER |
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| 2894 | |

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| 09/02/2011 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

LegalUSDocketing@mmm.com

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/595,678 | NODA, KAZUKI | |
| | Examiner | Art Unit | |
| | CALEB HENRY | 2894 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *18 April 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

5)☒ Claim(s) *1,2 and 4-13* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1,2 and 4-13* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

10)☒ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04/18/2011 has been entered.

### *Specification*

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumamoto (20030001283), in view of Storli (6885101), in further view of Mong (20030235937).

**Regarding claim 1**, Kumamoto teaches a semiconductor surface protecting method whereby the circuit side of a semiconductor wafer is protected during the step of back side grinding of the wafer, comprising in order:

providing a surface protecting layer (fig. 5a/5b, 550/550'; UV resin or thermo resin) coating the surface protecting layer on the circuit side of the semiconductor wafer (Kumamoto then places a back grinding tape above the adhesive, fig. 6, 510),

grinding (fig. 7, 350) said semiconductor wafer.

Kumamoto teaches using a UV resin, thermo resin or thermoplastic, but does not explicitly teach:

- a **fluid** surface protecting layer
- placing a polymeric film material over the fluid surface protecting layer,
- hardening said fluid surface protecting layer by exposure to radiation or upon heating
- wherein grinding said semiconductor wafer is done after hardening said fluid surface protecting layer.

Storli teaches a protective film (fig. 2, 80, col. 6, lines 9-11; thermosetting material or thermoplastic material), which is placed atop and around solder balls (fig. 2, 70), that protects the dies (fig. 2, 20) and the redistribution layer (fig. 2, 30) (which is the active surface of a die), wherein when this layer is applied to the active surface of the die, it is heated to a temperature that makes it deformable (col. 5, lines 52-67 and col. 6, lines 1-10) and upon being layered atop the active surface, it is cured by applying another temperature (col. 5, lines 52-67 and col. 6, lines 1-10). By using such a protective layer, which can be a thermo plastic or a thermo resin as require in Kumamoto, it would be possible to have adequate protection as explained in Storli and as desired in Kumamoto. Also, having such a material in Kumamoto, which can be

made pliable at a certain temperature, would allow for proper contouring of the protective layer around the solder balls of Kumamoto, thus preventing the existence of air bubbles which produce distortions in topography of the circuitry.

Mong teaches protecting the active surface of a wafer against back side grinding wherein after applying a back grinding tape (fig. 2B, 204) to protect the wafer, a reinforcing layer (fig. 2C, 208, flexible polymer; par. 18, 31-32) is placed in contact with layer. Then the wafers backside is ground. This layer further protects against warpage during back grinding and also protects against the tape (par. 6 and 18) which allows for the creation of thinner wafers (par. 7). Mong teaches that said reinforcing layer can be a heat cured polymer wherein the stiffness changes with the curing (par. 18, 31-31). Thus, upon layering, it would be advantageous to have a layer that is less stiff (allows for greater flowability) and before backside grinding, it would be advantageous to have the layer be stiffer (allowing for increased reinforcement for the thin wafer, which is the original purpose). Thus, in order for the layer to be stiffer, and thus be cured, it would have to be heated i.e. a thermo resin or thermoplastic.

Since both Kumamoto and Mong teach resins that can be cured via thermal heating, the layer below is necessarily cured when the layer above is heat cured. When thermally cured, the entire device is heated. Thus, the layer above and below are heated, and thus further cured, when the top layer is thermally cured. Knowing this, it can be inferred that the protective layer, taught by Kumamoto and further explained by Storli, is cured, at least partially, when the reinforcing layer of Mong is cured.

Furthermore, the MPEP teaches that the elimination of a step with the retention of the steps function is an indicia of unobviousness. The combination of Kumamoto, Mong and Storli shows a method step wherein there could potentially be two thermal steps to cure the protective layer (as taught by Kumamoto in view of Storli) and to cure the reinforcing layer (as taught by Mong). However, a single curing step after placing the reinforcing layer over the protective layer (and directly of the tape layer) would also cure both the protective layer and reinforcing layer since both layers can be thermal resins or thermo plastics. Claim 1 teaches a single heat treatment step after the polymer layer is layered which would cure the protective layer below the polymer. Thus, in both instances, the combination of Kumamoto, Mong and Storli and claim 1, the protective layer would be cured, after layering another polymer layer on top but before back side grinding.

Thus, it would have been obvious to one of ordinary skill in the art at the time said invention was made to utilize the teachings of Mong and Storli in the teachings of Kumamoto due to aforementioned reasons.

**Regarding claim 13**, please see rejection above in claim 1.

Claims 4-6, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumamoto/Mong/Storli as applied to claim 1 above, and further in view of Hosomi (5726219).

**Regarding claim 4**, Kumamoto/Mong/Storli, teach a semiconductor surface protecting method whereby the circuit side of a semiconductor wafer is protected during the step of back side grinding of the wafer.

Kumamoto/Mong/Storli, does not explicitly teach a surface protecting sheet according to claim 3, wherein, before hardening of the surface protective layer, the protective layer has an elastic shear loss modulus (G") less than its elastic shear storage modulus (G') at room temperature (20-25℃) and an elastic shear loss modulus (G") greater than its elastic shear storage modulus (G') at 30-100℃, as measured with a viscoelesticity measuring apparatus at a frequency of 10 Hz, a deformation of 0.04% and a temperature ramp rate of 3 ℃/rain., and the surface protective layer after hardening has an elastic tensile storage modulus (E') at 50℃ greater than 5 x 107 Pa as measured with a viscoelesticity measuring apparatus at a frequency of 1 Hz, a deformation of 0.04% and a temperature-ramp rate of 5℃/min.

Hosomi teaches a resin which contains the components necessary to form phenol-novolac epoxy (meth)acrylate resin (Hosomi, col. 2, lines 25 -50, (b)). Since phenol-novolac epoxy (meth)acrylate resin is one of the main materials that can be utilized as the in the surface protecting layer, it must have the characteristics laid out in claim 4.

Hosomi teaches that phenol-novolac epoxy (meth)acrylate resin offers heat resistance at temperatures as high as 260 degrees Celsius. Also, these resins can be used as UV resins, as well as a heat-curing resin, due to the fact that photo-

polymerization initiators are added (Hosomi, col. 2, lines 25-50). Kumamoto/Mong/Storli all teach the use of heat curing resins.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to append the teachings of Hosomi to the teachings of the Kumamoto/Mong/Storli due to aforementioned reasons.

**Regarding claim 5**, Kumamoto/Mong/Storli teach a semiconductor surface protecting method whereby the circuit side of a semiconductor wafer is protected during the step of back side grinding of the wafer.

Kumamoto/Mong/Storli does not teach a surface protecting sheet according to claim 3, wherein the surface protecting layer contains at least one type of a free-radical polymerizable compound having two or more ethylenically unsaturated moieties in the molecule, the free-radical polymerizable compound being:
(3) the following resins having a molecular weight of 1000 or greater which are solid at room temperature (20-25℃): phenol-novolac epoxy (meth)acrylate resins.

Hosomi teaches a resin which contains the components necessary to form phenol-novolac epoxy (meth)acrylate resin (Hosomi, col. 2, lines 25 -50, (b)).

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to append the teachings of Hosomi to the teachings of the Kumamoto/Mong/Storli combination because phenol-novolac epoxy (meth)acrylate resin offers heat resistance at temperatures as high as 260 degrees Celsius.

**Regarding claim 6**, Kumamoto/Mong/Storli, teach a semiconductor surface protecting method whereby the circuit side of a semiconductor wafer is protected during the step of back side grinding of the wafer.

Kumamoto/Mong/Storli, does not teach the use of a free-radical polymerization initiator.

Hosomi teaches the use of a free-radical polymerization initiator (photopolymerization initiator) (Hosomi, col. 2, lines 55-65, (e)).

Free-radical polymerization initiators are needed in UV curing resin in order to initiate polymerization reaction.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to append the teachings of Hosomi to the teachings of the Kumamoto/Mong/Storli combination because UV curing resins generally need a free-radical polymerization initiator in order for the UV light to have its intended effect.

**Regarding claim 9**, Kumamoto/Mong/Storli, teach a semiconductor surface protecting method whereby the circuit side of a semiconductor wafer is protected during the step of back side grinding of the wafer.

Kumamoto/Mong/Storli, does not teach a surface protecting sheet according to claim 3, wherein the surface protecting layer contains at least one type of a free-radical polymerizable compound having two or more ethylenically unsaturated moieties in the molecule, the free-radical polymerizable compound being:
(3) the following resins having a molecular weight of 1000 or greater which are solid at room temperature (20-25℃): phenol-novolac epoxy (meth)acrylate resins.

Hosomi teaches a resin which contains the components necessary to form phenol-novolac epoxy (meth)acrylate resin (Hosomi, col. 2, lines 25 -50, (b)).

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to append the teachings of Hosomi to the teachings of the Kumamoto/Mong/Storli combination because phenol-novolac epoxy (meth)acrylate resin offers heat resistance at temperatures as high as 260 degrees Celsius.

**Regarding claim 10**, Kumamoto/Mong/Storli, teach a semiconductor surface protecting method whereby the circuit side of a semiconductor wafer is protected during the step of back side grinding of the wafer.

Kumamoto/Mong/Storli, does not teach the use of a free-radical polymerization initiator.

Hosomi teaches the use of a free-radical polymerization initiator (photopolymerization initiator) (Hosomi, col. 2, lines 55-65, (e)).

Free-radical polymerization initiators are needed in UV curing resin in order to initiate polymerization reaction.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to append the teachings of Hosomi to the teachings of the Kumamoto/Mong/Storli combination because UV curing resins generally need a free-radical polymerization initiator in order for the UV light to have its intended effect.

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumamoto/Mong/Storli as applied to claim 1 above, and further in view of Komiyama (5118567).

**Regarding claim 7**, Kumamoto/Mong/Storli, teach a semiconductor surface protecting method whereby the circuit side of a semiconductor wafer is protected during the step of back side grinding of the wafer.

Kumamoto/Mong/Storli, does not teach a surface protecting sheet according to claim 3 wherein the surface protecting layer contains at least one cationically polymerizable compound having two or more cationically polymerizable groups in the molecule, the cationically polymerizable compound being:
(2) phenol-novolac epoxy resins of molecular weight 1000 or greater which are solid at room temperature.

Komiyama teaches the use of an adhesive tape which is composed of phenol-novolac epoxy resin (Komiyama, col. 3, lines 57-67). This adhesive tape has adhesive/releasing properties which are well balanced, which initially was a problem in prior art (Komiyama, col. 1, lines 30-36).

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to append the teachings of Komiyama to the teachings of the Kumamoto/Mong/Storli combination because it offers a balance between adhesive and releasing properties.

**Regarding claim 8** Kumamoto/Mong/Storli teach a semiconductor surface protecting method whereby the circuit side of a semiconductor wafer is protected during the step of back side grinding of the wafer.

Kumamoto/Mong/Storli, does not teach the use of a free-radical polymerization initiator.

Komiyama teaches the use of a cationic polymerization initiator (photopolymerization initiator) (Komiyama, col. 2, lines 1-12).

Cationic polymerization initiators are needed in UV curing resin in order to initiate polymerization reaction.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to append the teachings of Komiyama to the teachings of the Kumamoto/Mong/Storli combination because UV curing resins generally need a free-radical polymerization initiator in order for the UV light to have its intended effect.

Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumamoto/Mong/Storli/Hosomi as applied to claim 4 above, and further in view of Komiyama (5118567).

**Regarding claim 11** Kumamoto/Mong/Storli/Hosomi teach a semiconductor surface protecting method whereby the circuit side of a semiconductor wafer is protected during the step of back side grinding of the wafer.

Kumamoto/Mong/Storli/Hosomi do not teach a surface protecting sheet according to claim 3 wherein the surface protecting layer contains at least one

cationically polymerizable compound having two or more cationically polymerizable groups in the molecule, the cationically polymerizable compound being:

(2) phenol-novolac epoxy resins of molecular weight 1000 or greater which are solid at room temperature.

Komiyama teaches the use of an adhesive tape which is composed of phenol-novolac epoxy resin (Komiyama, col. 3, lines 57-67). This adhesive tape has adhesive/releasing properties which are well balanced, which initially was a problem in prior art (Komiyama, col. 1, lines 30-36).

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to append the teachings of Komiyama to the teachings of the Kumamoto/Mong/Storli/Hosomi combination because it offers a balance between adhesive and releasing properties.

**Regarding claim 12**, Kumamoto/Mong/Storli/Hosomi teach a semiconductor surface protecting method whereby the circuit side of a semiconductor wafer is protected during the step of back side grinding of the wafer (Oka, col. 2, lines 55-65).

Kumamoto/Mong/Storli/Hosomi does not teach the use of a free-radical polymerization initiator.

Komiyama teaches the use of a cationic polymerization initiator (photopolymerization initiator) (Komiyama, col. 2, lines 1-12).

Cationic polymerization initiators are needed in UV curing resin in order to initiate polymerization reaction.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to append the teachings of Komiyama to the teachings of the Kumamoto/Mong/Storli/Hosomi combination because UV curing resins generally need a free-radical polymerization initiator in order for the UV light to have its intended effect.

### *Allowable Subject Matter*

**Claim 2** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: While Mong teaches layer the backside grinding tape in a vacuum (par. 21) and Kumamoto teaches the same for the back grinding layer and adhesive (par. 34). However, the references, either alone of in combination, do not teach placing and hardening steps in a vacuum.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CALEB HENRY whose telephone number is (571)270-5370. The examiner can normally be reached on 9 a.m.-5 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim Nguyen can be reached on 571-272-2402. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/CALEB HENRY/
Examiner, Art Unit 2894

/Kimberly D Nguyen/
Supervisory Patent Examiner, Art Unit 2894